Sets: operations

New sets from old

Venn Diagram for 2 Sets

union

$$A \cup B := \{x \mid x \in A \text{ OR } x \in B\}$$

intersection

$$A \cap B := \{x \mid x \in A \text{ AND } x \in B\}$$
A set-theoretic equality

\[ A \cup (B \cap C) = (A \cup B) \cap (A \cup C) \]

proof: Show these have the same elements, namely,
\( x \in \text{Left Hand Set} \iff x \in \text{RHS} \) for all \( x \).

proof uses fact from last time:

\[ P \lor (Q \land R) \equiv (P \lor Q) \land (P \lor R) \]
A set-theoretic equality

proof:

\[(x \in A \text{ or } x \in B) \land (x \in A \text{ or } x \in C) \iff (x \in A \cup B) \land (x \in A \cup C) \text{ (def } \cup) \land x \in (A \cup B) \cap (A \cup C) \text{ (def } \cap)\].

QED

\[A - B ::= \{x \mid x \in A \text{ AND } x \not\in B\}\]

complement

\[\overline{A} ::= \mathcal{D} - A = \{x \mid x \not\in A\}\]

complement

\[\overline{A} ::= \mathcal{D} - A = \{x \mid x \not\in A\}\]